What is claimed is:

1. A method of fabricating individually addressable electrode arrays, said method including the steps of:

providing an inert substrate;

applying photoresist to said substrate;

photolyzing preselected regions of said photoresist, said photolyzed regions being removable using a developer;

depositing one or more metals on said substrate;

removing predetermined regions of said metals, the remaining regions forming said array of individually addressable electrodes.

2. The method of claim 1, wherein said step of photolyzing preselected regions of said photoresist includes the steps of:

placing an electrode mask over said wafer; and

exposing said wafer to ultraviolet light.

3. The method of claim 1, wherein said step of depositing one or more metals on said substrate comprises the deposition of an adhesion layer followed by the deposition of an electrode layer.

4. The method of claim 3, wherein said deposition of said adhesion layer comprises depositing between about 100 and 500 Å of a metal selected from the group consisting of Cr, Ta and W.

5. The method of claim 3, wherein said deposition of said electrode layer comprises depositing between about 1000 and 5000 Å of a metal selected from the group consisting of Au, Ag, Cu and Pt.

6. The method of claim 1, further comprising the step of depositing an insulating coating on selected regions of said substrate.

7. The method of claim 6, wherein said step of depositing said insulating coating on selected regions of said substrate includes the steps of:

applying a second layer of photoresist to said inert substrate;

photolyzing preselected regions of said photoresist, the remaining regions being removable using a developer; and

annealing said substrate for a predetermined time at a predetermined temperature.

8. The method of claim 7, wherein said step of photolyzing preselected regions of said photoresist includes the steps of:

placing an isolation mask over said wafer; and

exposing said wafer to ultraviolet light.

9. The method of claim 7, wherein said step of annealing said substrate comprises heating said substrate at between about 90-130°C for between about 1-10 minutes.

10. An array of individually addressable electrodes on an inert substrate, said array consisting of:

a plurality of electrode pads;

a plurality of contact pads;

wires connecting said contact pads to said electrode pads; and

an insulating layer covering said wires and a predetermined portion of said contact pads.

11. The array of claim 10, wherein said electrode pads are located substantially in the center of said substrate and said contact pads are located around the peripheral edge of said substrate.

12. The array of claim 10, wherein said inert substrate is selected from the group consisting of glass, quartz, sapphire, alumina, plastic and thermally treated silicon.

13. The array of claim 10, wherein said insulating layer is selected from the group consisting of glass, silica, alumina, magnesium oxide, silicon nitride, boron nitride, yttrium oxide, titanium dioxide, and hardened photoresist.

14. The array of claim 10, wherein said electrode pads, said contact pads, and said wires are fabricated from conducting materials.

15. The array of claim 14, wherein said conducting materials are independently selected from the group consisting of gold, platinum, silver and copper.

16. The array of claim 10, wherein said plurality of electrode pads comprises at least 10 electrodes.

17. The array of claim 16, wherein said plurality of electrode pads comprises up to 100 electrodes.

18. The array of claim 10, wherein said electrode pads have a surface area of between 1 and 2 mm^2.

19. A method of depositing diverse materials on individually addressable electrode arrays, said method including the steps of:

providing an array of individually addressable electrodes, a power source, a reference electrode and a counter electrode;

delivering a mixture of source materials to predetermined locations on said array; and

depositing a predetermined composition of said source materials on a given electrode on said array.

20. The method of claim 19, wherein said step of delivering said mixture of said source materials includes the steps of:

positioning a deposition head over a given electrode on said array; and

activating a predetermined number of syringe pumps associated with said deposition head, said activation delivering a predetermined composition of said source materials to said predetermined locations on said array.

21. The method of claim 20, wherein said step of positioning said deposition head over said given electrode is accomplished using robotics.

22. The method of claim 21, wherein said robotics position said deposition head at a predetermined distance above said given electrode.

23. The method of claim 19 wherein said depositing step includes a step selected from the group consisting of changing the deposition potential, changing the length of the deposition time, varying the counter anions, using different concentrations of said source materials, and selecting the appropriate electrochemical deposition program.

24. The method of claim 23, wherein said electrochemical deposition program is selected from the group consisting of potentiostatic reduction, potentiostatic oxidation, galvanostatic reduction, galvanostatic oxidation, potential square-wave voltammetry, and potential stair-step voltammetry.

25. An apparatus for depositing diverse materials onto an array of individually addressable electrodes, said apparatus comprising:

a rod having a tapered end;

a solution delivery tube within said rod;

a reference electrode within said solution delivery tube;

a counter electrode attached to said rod;

means for controlling the composition and flow rate of liquids through said solution delivery tube;

means for mixing said liquids before said liquids exit said solution delivery tube; and

means for controlling the position of said apparatus over said array.

26. The apparatus of claim 25, wherein said means for controlling the composition and flow rate of said liquids through said solution delivery tube comprises at least one syringe pump.

27. The apparatus of claim 25, wherein said means for mixing said liquids before said liquids exit said solution delivery tube comprises an external mixer.

28. The apparatus of claim 25, wherein said means for mixing said liquids before said liquids exit said solution delivery tube comprises a frit, said frit embedded in said rod.

29. The apparatus of claim 25, wherein said means for controlling the position of said apparatus over said array comprises robotics.

30. A system for electrochemically screening an array of materials, said system comprising:

an array of materials having an individually addressable electrode for each material in the array; and

means associated with each of said electrodes for simultaneously testing each of said materials for said specific material property.

31. The system of claim 30, wherein said means comprises an electrochemical cell, a multi-channel potentiostat, and a printed circuit board assembly.

32. The system of claim 31, wherein said electrochemical cell comprises:

a cylindrical glass housing, said housing sandwiched between two end members and held in place with at least four screw fasteners;

a reference electrode compartment;

a liquid filling hole;

a cathode assembly; and

an anode array assembly, said anode array assembly holding said array of individually addressable electrodes.

33. The system of claim 32, wherein said anode array assembly comprises:

a first o-ring, said first o-ring forming a water-tight seal with said glass housing;

a molded adapter having an inner flange, an outer flange, and at least one groove;

an array of individually addressable electrodes;

a second o-ring, said second o-ring fitting into said groove and forming a water-tight seal with said array of individually addressable electrodes;

a printed circuit board;

a ring of elastomeric contacts, said elastomeric contacts located between said array and said printed circuit board; and

a backing plate.

34. The system of claim 33, wherein said printed circuit board comprises:

a predetermined number of contact pads, said number of contact pads corresponding to the number of individually addressable electrodes on said array;

at least four high density pin connectors;

a common reference electrode contact; and

a common counter electrode contact.

35. A method of testing a specific property of a material, said method including the steps of:

depositing distinct materials on an array of individually addressable electrodes;

placing said array in an electrochemical cell; and

screening said array for said specific property.

36. The method of claim 35, wherein said screening comprises:

pulsing all of said electrodes on said array to a predetermined potential and monitoring and recording the current that is passed.

37. The method of claim 35, wherein said specific property for said array is screened in a time frame of less than 5 minutes.